**NASA Headquarters
Information Technology & Communications Division**

**Information Technology Tactical Plan
FY2009, FY2010 and FY2011**

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1   Purpose

This document provides the National Aeronautics and Space Administration (NASA) Headquarters (HQ) Information Technology (IT) Tactical Plan for fiscal years 2009, 2010, and 2011. It serves as the basic planning document for the HQ IT infrastructure and services including enhancements, upgrades, new initiatives, and compliance resolution.

The Tactical Plan comprises the known and significant customer services, Agency and Federal initiatives, infrastructure efficiencies, and sustaining maintenance activities. These are listed with descriptions and estimates of core labor and other direct costs (ODC) to communicate a clear idea of the activities to HQ Information Technology and Communications Division (ITCD) customers and stakeholders. A summary table is presented at the end of the plan that depicts each activity by Capital Planning and Investment Control (CPIC) priority, functional category, and strategic alignment.

This Tactical Plan is devised as a planning document to help the HQ customers and ITCD focus manpower and plan budgets, address the requirements of our community, and maintain compliance with Agency and Federal mandates. The plan proposes and provides a basic priority, benefits, rationale, and approximate cost for each proposed project supporting the customers of HQ IT services. However, the Tactical Plan is not an exhaustive list of every activity that the HQ ITCD is engaged in, nor is it a complete list of all projects considered. Rather, it is a list of projects bounded by and contained within a specific ITCD budget.

2   Strategic Vision

Guiding principles and business drivers influence the selection and ranking of initiatives in this plan, many of which are derived from the NASA Information Resources Management Strategic Plan as mandated by NPD 2800.1A. These principles are described below.

2.1   Adapt to Emerging Technologies

"Provide an IT infrastructure that can evolve and adapt to emerging technologies and service models."

IT has evolved largely through a bottom-up approach, with many related parallel efforts emanating from Centers and programs. This has resulted in an architecture that (as a whole) is slow to adapt and interoperates only at great expense.

NASA has facilities around the world, and mobile computing eliminates the concept of business hours. It is HQ's goal to provide IT services that are available at all times and the technology to access those services from any location. As a design discipline, our services must be provided in a way to assure that they are always available. Highly available architectures reduce the cost of maintenance and service, and position us favorably to have our services mirrored at multiple sites for continuity of operations.

NASA has huge repositories of information and institutional knowledge that it is unable to fully leverage, due in part to limitations in information technology. As these technology barriers are lifted, NASA HQ must continue to press forward with initiatives to free this knowledge, so it can be

productively used. Fundamental changes are required in the way we acquire, process, and manage data in order to assure that information and data assets can be discovered, trusted, and repurposed.

Tactical initiatives included in the FY2009-2011 plan that support this strategic driver include:
- Cisco Unified Personal Communicator SoftPhone
- Secure Remote Access
- Upgrade the HQ Network Trunk Interconnect to 10G
- Life Cycle Replacement of the HQ Wireless Network
- Implement IPTV
- Enhance Desktop Recovery Tivoli Storage Manager (TSM)
- Life Cycle Replacement of Servers
- Enhance Enterprise Storage
- Enhance Enterprise Backup
- Restructure and Consolidation of HQ VLANs
- Disk-to-Disk Enterprise Backup
- Investigate Server Virtualization
- Continuation of ColdFusion Upgrade
- Continuation of Oracle Upgrade to 10G
- Update Multimedia Offsite Support Capabilities
- Update Multimedia Architecture/Web Streaming
- Customer Service Enhancements
- Implement Automated Requirements, Test Suite, and Test Data Development
- MicroPact entelliTrak COTS Tool
- Update HQ Based Search Engine
- COTS Survey Tool
- Service-Orientated Architecture (SOA)
- Implement Web Link Checker/Crawler
- Investigate New Web Application Reporting Tools
- IPv6 Capability for Perimeter and Core
- Life Cycle Replacement of HQ Firewall Systems HW
- Improve Monitoring Capabilities with NETIQ Security Manager

2.2   Common Tools and Services

"Optimize investments in mission and program-unique IT systems by utilizing common infrastructure tools and services where practical."

An over-arching goal at NASA, and the inspiration for many ongoing projects, is the objective of enabling NASA to work as a single team without regard to geography or organizational affiliation. In an effort to reduce costs, Agency consolidation has motivated numerous projects to migrate infrastructure and operations to a central provisioner, with more to come in the future.

Tactical initiatives included in the FY2009-2011 plan that support this strategic driver include:
- Agency "Class" VoIP Disaster Recovery/Avoidance Solution Continuity of Operations Plan (COOP)
- Design and Implementation of VoIP Intercluster Trunking
- Assess the Benefit Associated with Unity and NOMAD Interoperability
- Implementation of DHCP across the HQ Private Network
- Continuation of Oracle Upgrade to 10G
- Implement Automated Requirements, Test Suite, and Test Data Development

- Common Set of Development/DBA Tools
- MicroPact entelliTrak COTS Tool
- Update HQ Based Search Engine
- COTS Survey Tool
- Service-Orientated Architecture (SOA)

2.3 Mission and Customer Focus

"Provide a mission and customer focus to the provisioning of common IT services across NASA."

IT is never an end in itself, but rather a tool for fulfilling NASA missions and meeting its objectives. We maintain a customer focus to guide us to the correct solution for a given situation, then work to deliver that solution with quality and reliability. User outreach will be provided to make sure our customers are aware of our valuable services.

Tactical initiatives included in the FY2009-2011 plan that support this strategic driver include:
- Design and Implementation of VoIP Intercluster Trunking
- Implement 1 Gig to Select Desktops to Support Digital Asset Management
- Cisco Unified Personal Communicator SoftPhone
- Upgrade the HQ Network Trunk Interconnect to 10G
- Life Cycle Replacement of the HQ Wireless Network
- Enhance Desktop Recovery Tivoli Storage Manager (TSM)
- Life Cycle Replacement of Servers
- Enhance Enterprise Storage
- Restructure and Consolidation of HQ VLANs
- Disk-to-Disk Enterprise Backup
- Update Multimedia Offsite Support Capabilities
- Update Multimedia Architecture/Web Streaming
- Customer Service Enhancements
- COTS Survey Tool
- Implement Web Link Checker/Crawler
- Caching Proxy/Reverse Proxy Architecture

2.4 Security

"Protect and secure the Agency's information assets."

IT Security is not something you buy, but rather a discipline that must be integrated into every service provided to NASA. We must believe in our data and ensure that it is both credible and available. The more widely and pervasively IT is deployed, the greater the need to have security "built in" and not "bolted on" as an afterthought. NASA must explore mechanisms to drive down the increasing costs of security assurance plans, equipment, and reporting, while maintaining compliance with Federal and Agency mandates.

Tactical initiatives included in the FY2009-2011 plan that support this strategic driver include:
- Secure Remote Access
- Data Encryption Capability for Enterprise Storage
- Caching Proxy/Reverse Proxy Architecture

- Life Cycle Replacement of HQ Firewall Systems HW
- Implement Policy Compliance Scanning
- Improve Monitoring Capabilities with NETIQ Security Manager
- Improve IDS Infrastructure
- Improve Forensic Capabilities
- Security Content Automation Tools S-CAP

2.5　Unified Investment Portfolio

"Maintain an Agency-wide IT investment portfolio in alignment with missions and business needs."

As always, we must be good stewards of NASA resources by reducing cost and increasing efficiency and automation. We continue the move away from manual processing and towards fully automated or "lights out" operations. We also seek to reduce cost by adopting common architectures and leveraging NASA's vast economies of scale. Finally, managing our services as an integrated portfolio is a required step in migration to Service Orientated Architectures and assuring alignment with the Agency's Enterprise Architecture.

Tactical initiatives included in the FY2009-2011 plan that support this strategic driver include:
- Assess the Benefit Associated with Unity and NOMAD Interoperability
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2.6　Effective Work Force

"Maintain a strong IT workforce through effective human capital management."

NASA's most important resource is its people, therefore the greatest gains are to be found from enabling communication and collaboration among people. Whether it is efficient broadcast of information, collaborative workgroups, or reliable person-to-person communications, the reliability, capabilities, and quality of collaboration tools must continuously be improved. We will promote designs and approaches that will enable our customers to discover information relevant to their

activities, communities of similar interests, and more automated mechanisms for obtaining and sharing information.

Virtually all tactical initiatives included in the FY2009-2011 plan support this strategic driver. Those activities with direct support include: customer driven workstation file back up and restore; building wide DHCP; wireless upgrades; improved remote access; improved search; and a streamlining of new action tracking and custom applications (SOA).

3   Scope

In general, this plan proposes improvements to HQ-wide IT services provided and managed by ITCD, which reports to the HQ Office of Infrastructure and Administration (OIA). Services sited at HQ that are not part of the ITCD-provided and managed infrastructure (e.g. Mission directorate IT systems) may influence but are not a part of this plan.

4   Tactical Plan Initiatives in Context

This section provides an overview of the tactical plan initiatives and discusses them in the context of their business and strategic drivers. Many initiatives are based on recurring common themes; this is a reflection of HQ's unified approach to architecture and management, as well as Agency consolidation initiatives.

4.1   Infrastructure

The most significant recurring theme in the area of infrastructure improvement is redundancy and high-availability. The requirements for fault tolerance and high availability include: (a) no downtime; (b) lower maintenance and repair costs; and (c) continuity of operations. Our approach to addressing these requirements has evolved steadily. We once relied on hardened server components and later on "high availability" servers with redundant components. This trend must continue: we must build reliable services that do not rely on a single server and ultimately provide geographically distributed services that do not rely on the availability of a specific building or geographic region. The expansion and direct use of high-availability storage will greatly improve service availability. The high-availability Intranet, Extranet, and database services also address this need.

Additional themes are security and ease of use. These concepts often compete with one another if not carefully designed. This will be accomplished through the redesign and implementation of simplified network Virtual Local Area Network (VLAN) architecture. Network security technology adds intelligence to the network and enables the network to automatically configure and provision the proper service to the devices that attach to it.

4.2   Continuous Improvement and Maintenance Projects

The large array of HQ systems and services already deployed require ongoing maintenance, as well as upgrades to meet evolving needs. These continuous improvement projects are described separately from new initiatives, although there is often overlap and interdependence between the two. Several projects attend to system and infrastructure upgrades that are necessary to keep pace with technology and evolving requirements. These projects include enhancements to enterprise-wide enterprise storage and backup services.

4.3   Telecommunications

Regardless of their location, HQ customers require reliable and secure access to Agency services and services hosted in our computer facility. Our telework capabilities will receive continuous upgrades and improvements that will provide additional functionality, increased capacity, and redundancy to ensure service availability.

4.4   Security

Security initiatives will provide system monitoring and auditing improvements that will facilitate automated reactions to possible security incidents, thus reducing response time and meeting ever-increasing incident reporting requirements.

4.5   Application Services

This plan describes many projects that are the result of our renewed focus on the importance of integrating data and information. Some of our customers require access to many similar or related pieces of information that reside in different databases or data repositories. It is difficult to discover where all these related pieces of data are and, once discovered, difficult to collect the needed pieces and combine them together. We intend to apply the same type of Web Services deployed in Web-based business applications to tie logical pieces of data together and conform to multiple workflows. Treating the Web as a platform we can leverage current applications and strategies to create richer content and meaning and sharing outside the boundaries of traditional databases. We will look to current Web service and machine discoverable (semantic) technologies to turn data sources into reusable resources that can be harvested through browsing and queries. This effort will achieve increases in efficiency and will reduce analytic compilation time for data calls, budget formulations, and program decision support.

5   Tactical Plan Initiatives in Detail

This section describes each project in the portfolio of projects that may be executed within the next thirty-six months.

5.1   Voice Services

All IT investments required for providing voice services to users.

5.1.1   *Agency "Class" VoIP Disaster Recovery/Avoidance Solution Continuity of Operations Plan (COOP)*

This project will enable inbound and outbound trunk failover between NASA centers. If one center were to have a Public Switched Telephone Network (PSTN) trunk failure, traffic could be re-routed to another NASA Voice over Internet Protocol (VoIP) center and inbound and outbound dialing could be largely unaffected.

5.1.1.1   Project Priority: *M*

5.1.2   *Design and Implementation of VoIP Intercluster Trunking*

This will allow for CallManager to CallManager communications across the Wide Area Network (WAN). Calls can be originated and received by any NASA center that has implemented Cisco VoIP across the NASA network infrastructure bypassing the PSTN and implementing features such as direct call forwarding, 5 digit dialing and advanced VoIP features.

5.1.2.1   Project Priority: *P*

5.1.3   *Assess the Benefit Associated with Unity and NOMAD Interoperability*

This project will include an analysis to determine the benefit, if any, related to the potential interoperability between NASA HQ voicemail and NASA Agency Email included in the NASA Operational Messaging and Directory Service (NOMAD).

5.1.3.1   Project Priority: *P*

5.1.4   *Implement 1 Gig to Select Headquarters Desktops*

Currently, network bandwidth to the desktop is limited by the model of the Cisco VoIP phone deployed to all users at NASA HQ. The current VoIP phone limits network bandwidth to the end users at 100Mb/s. The new 7975 Cisco phones will increase bandwidth to end-users by an order of magnitude (1Gb/s). The NASA HQ network infrastructure is capable of providing 1Gb/s to a limited number of customers. This initiative will replace the current 7970 VoIP telephones with the 7975 VoIP telephones for customers that require 1Gb/s service to the desktop.

5.1.4.1   Project Priority: *M*

5.1.5   *Cisco Unified Personal Communicator SoftPhone*

The implementation of the Cisco Unified Personal Communicator SoftPhone allows easy access to voice, video, instant messaging, Web conferencing, voice mail, and presence information from a single, multimedia interface on a PC or Mac. An integral component of the Cisco Unified Communications family of products, Cisco Unified Personal Communicator is a powerful desktop computer application that uniquely integrates the most frequently used communications applications and services.

5.1.5.1   Project Priority: *P*

5.1.6   *VoIP Hardware Life Cycle Replacement*

A service as critical as the telephone requires assurance that current levels of support in both hardware and software VoIP infrastructure components are maintained promptly. This effort covers

servers and gateways needed to make sure that our voice services remain at high levels of availability and service.

5.1.6.1   Project Priority: *M*

5.2   Wide Area Network (WAN)

All Information Technology (IT) investments required for supporting network communications between NASA Local Area Networks (LANs), NASA data centers, and external partners.

5.2.1   Secure Remote Access

The HQ Public IPsec Virtual Private Network (VPN) service is implemented using a pair of redundant Cisco VPN 3080 concentrators. Separate profiles are utilized for NASA HQ employees, general-support contractors, and operations support. Different resources are available to these different customer communities. The Cisco 3080 hardware is approaching End of Life (EOL) and end of vendor support and will possibly have to be replaced. With this project, NASA HQ will evaluate different options for replacing the IPSec VPN service.

5.2.1.1   Project Priority: *M*

5.3   Local Area Networks (LAN)

Local Area Network (LAN) components refer to all Information Technology (IT) investments required to provide networking services within a building, campus, data center or Center, including hardware, software, and services.

5.3.1   Upgrade the HQ Network Trunk Interconnect to 10G

The throughput capacity of the HQ network backbone was recently upgraded from 1Gbps to 2Gbps in order to provide sufficient bandwidth to support the Desktop Computer Backup project. This trend toward greater peak network utilization is expected to continue with future developments such as:
- Ability to support 1 Gbps throughput to desktop computers
- Increasing use of large network-based storage such as the 100TB NetApp 3070
- Increasing use of video, real-time collaboration, and "rich client" real-time applications

This project will upgrade the NASA HQ network infrastructure sufficiently to support a 10-gigabit network backbone and 1 gigabit to all LAN ports.

5.3.1.1   Project Priority: *M*

5.3.2   Life Cycle Replacement of the HQ Wireless Network

Currently, the NASA HQ wireless network is composed of two components: a Wireless Guest Network and a Private Network Wireless Network. A single set of wireless access points is used to provide connectivity for both networks.

Both the hardware and software infrastructure supporting the HQ wireless network is approaching end-of-life and end-of-vendor support, and life cycle replacement will be done as part of this project. Additionally, new technology enhancements will reduce maintenance.

Each network is implemented as VLANs on wireless access points that are trunked to the HQ switches. NASA HQ utilizes autonomous access points. Guest Wireless is controlled using a captive portal implemented on an appliance. Private Wireless is implemented using WiFi Protected Access (WPA) and requires a SecurID RSA token for access. "Wireless roaming for guest" works HQ building wide. Roaming for private wireless currently works on a per-floor basis. The wireless network is managed using a Wireless LAN Solution Engine (WLSE) and monitored using HP OpenView. NASA HQ will examine the possibility of enhancing the roaming capability for the private wireless network. At this time, the vendor (Cisco) is recommending a Wireless Controller based network solution which uses 'dumb' access points. NASA HQ will determine if it should move in this direction for future iterations of its wireless network.

5.3.2.1   Project Priority: *M*

5.4   Video Infrastructure Services

Information Technology (IT) investments required for supporting video distribution and video conferencing services used by NASA including hardware, software and support services.

5.4.1   Implement IPTV

A pilot of Internet Protocol Television (IPTV) will be implemented to a select number of end users to demonstrate the feasibility of scaling to a more robust video architecture. Involvement from NASA TV will be necessary in order to complete the pilot. An additional pilot of streaming to new media platforms such as PDA, Google Gadgets, and Apple Widgets will be investigated and prototyped.

5.4.1.1   Project Priority: *P*

5.5   Workstations

IT investments required to provide desktop computing services to users: hardware and software (operating systems, applications, and utilities) and services (including design, build, operations, multipurpose help desks, support, and maintenance services). Includes peripherals/printers (networked and local attached), workstation virus protection.

5.5.1   Enhance Desktop Recovery Tivoli Storage Manager (TSM)

The Desktop Recovery project is based on Tivoli Storage Manager (TSM). This effort will upgrade the TSM software to the latest stable release. In addition, capacity planning will be used to optimize server and storage hardware. Network bandwidth will be examined to ensure users can be backed up and restored during the shortest window. Ad-hoc customer driven backup and restore for select files will be implemented as well as secure remote backup services for those customers on travel. IBM's Continuous Data Protection (CDP) will be investigated.

5.5.1.1   **Project Priority:** *M*

5.6   **Data Center**

Includes data storage (mass storage systems, digital data storage services, supercomputers, computing clusters such as Beowulf) including hardware, software, services, etc.), database management and administration services, data/document management systems, and disaster recovery services. In addition, the Data Center category includes server/hosting hardware and associated operating system software and system administration, which are not part of a shared Data Center.

5.6.1   *Life Cycle Replacement of Servers*

This initiative proposes to evaluate legacy server platforms and upgrade the hardware and operating systems to newer technology where appropriate. There are servers in the NASA HQ Infrastructure that have reached end-of-life, and are no longer fully supported by the vendor. These servers will be upgraded or replaced by current technology. Servers in need of upgrade will also be evaluated to determine whether their services can be consolidated. The deployment of current operating system software is essential to increase security, provide reliability, and simplify administration of the NASA HQ server infrastructure.

5.6.1.1   **Project Priority:** *M*

5.6.2   *Enhance Enterprise Storage*

This project will employ capacity planning techniques to ensure that the enterprise disk storage, the NetApp 3070 and NetApp 2050, are of sufficient storage and throughput capacity to meet current and projected 3-year requirements. The objective of this initiative is to replace any storage components approaching end-of-life. Procure any additional Serial Attached Technology Attachment (SATA) or Fiber Channel (FC-AL) drives to augment or replace existing storage as indicated by capacity planning.

5.6.2.1   **Project Priority:** *M*

5.6.3   *Enhance Enterprise Backup*

This project will employ capacity planning techniques to ensure that the enterprise tape storage is of sufficient storage and throughput capacity to meet current and projected 3-year requirements. The objective of this initiative is to replace any storage components approaching end-of-life. The 8 LTO 2 drives in the Advanced Digital Information Corporation (ADIC)/Quantum I2000 do not provide the storage capacity or throughput required for the NASA HQ enterprise backup solution. The new generation of LTO4 drives will provide the storage density and throughput required.

5.6.3.1   **Project Priority:** *M*

5.6.4   Restructure and Consolidation of HQ VLANs

By restructuring NASA HQ VLANs into a facility-based architecture, VLANS will be aligned with core business functions and services that do not change frequently. The VLAN design could extend this segregation to things that can logically and functionally be separated, regardless of whether they are changeable. This restructuring and consolidation of VLANs will result in reduced administrative overhead.

The redesign of the network from an organization-based VLAN architecture to a facility-based VLAN architecture will greatly simplify the network and permit the implementation of features designed to minimize disruption of service in the event of a component failure.

5.6.4.1   Project Priority: *M*

5.6.5   Implementation of DHCP across the HQ Private Network

Currently, most NASA HQ workstations use static Internet Protocol (IP) addressing. There is currently an Agency project, IPAM, (IP Address Management) that will "develop and deploy IP address management architecture for the Agency to support enterprise IP address management". This project encompasses Agency-wide Dynamic Host Communications Protocol (DHCP) and Domain Naming Services (DNS) services. NASA HQ will participate in the IPAM project and implement the Agency IPAM (DHCP) solution.

The benefits of DHCP include minimized configuration errors caused by manual IP address configuration, such as typographical errors, as well as address conflicts caused by a currently assigned IP address accidentally being reissued to another computer. Transmission Control Protocol (TCP)/IP configuration is centralized and automated, potentially reducing errors and reducing the level of effort managing IP address assignments. Network administrators can centrally define global and subnet-specific TCP/IP configurations. Address changes for client configurations that must be updated frequently, such as remote access clients that move around constantly, can be made efficiently and automatically when the client restarts in a new location.

5.6.5.1   Project Priority: *M*

5.6.6   Disk-to-Disk Enterprise Backup

Historically, magnetic tape has been the backup medium of choice, in part because traditionally it has been less expensive than other storage options. However, the cost gap between inexpensive disk technologies and tape is narrowing. In addition, tape is slower, sometimes substantially, than disk. As the amount of data that organizations have and need to back up has grown, the amount of time it takes to back up all that data to tape has become increasingly expensive. Likewise, retrieving data on tape can be a time-consuming process.

Currently, NASA HQ is consuming approximately 50 new tapes per week to meet the data retention and backup rotation scheme. This results in a yearly tape cost of approximately $130,000. This does not include the human costs of maintaining and labeling the tapes, sending tapes off site for data vaulting, or the costs of expensive enterprise tape libraries and robotics.

Tape breaks, it's vulnerable to environmental factors such as humidity and heat, and it loses tension. Tape drive heads require periodic cleaning, and data isn't always restored perfectly due to these and other factors. Some experts estimate that from 25% to 50% of tape restorations fail, at least partially.

Disks are more durable than tape: they last longer, and they hold up under more frequent overwriting. Because they are contained in a sealed environment, there is less chance of the media being affected by external environmental factors.

While tape may still be the medium of choice for off-site data vaulting, disk may be the backup medium of choice for on-site data.

Virtual tape libraries (VTLs) offer an excellent method of integrating disk-based backup into an established enterprise tape-backup system. Under this project, a form of enterprise disk-based backup or VTL will be implemented to augment the current ADIC/Quantum I2000 enterprise tape library.

5.6.6.1   Project Priority: *P*

5.6.7   *Investigate Server Virtualization*

There has been a proliferation of servers within the production, SEF, and development environments. Additional servers require additional power, cooling, and management.

Server virtualization is the masking of server resources, including the number and identity of individual physical servers, processors, and operating systems, from server users. The server administrator uses a software application to divide one physical server into multiple isolated virtual environments. The virtual environments are sometimes called virtual private servers, but they are also known as partitions, guests, instances, containers, or emulations.

There are three popular approaches to server virtualization: the virtual machine model, the paravirtual machine model, and virtualization at the operating system layer. Server virtualization within the NASA HQ production, SEF, and development environments will be investigated as a strategy to reduce the overall number of physical servers and achieve increased efficiencies.

The focus of this project will be on the cost savings associated with reduced investment requirement, reduced administrative overhead, and reduced maintenance costs associated with server virtualization.

5.6.7.1   Project Priority: *P*

5.7   Application Services

This category provides a service to Information Technology (IT) end-users, and includes the development, operations and maintenance of applications that are not science and engineering workstations.

5.7.1   *Continuation of ColdFusion Upgrade*

The Intranet and Extranet application servers must be upgraded to a more current version of the ColdFusion applications development environment. NASA HQ is running version 6.0 of ColdFusion, which is known to have problems. ColdFusion version 6 has reached end-of-life. In order to mitigate these issues, this project will upgrade ColdFusion to version 8.

5.7.1.1   **Project Priority:** *M*

5.7.2   *Continuation of Oracle Upgrade to 10G*

While some applications have been migrated to Oracle 10g, Oracle Version (9i) is still running on some production servers. This version is not supported on newer server hardware and operating systems. Further, it is more costly to maintain and test across multiple versions of Oracle. As the life cycle replacement of server hardware and server OS continues, the version of Oracle needs to be upgraded to remain "in-sync." This project will complete the migration to Oracle 10g. The applications will be migrated one at a time to minimize risk, and compatibility issues will be addressed on a case-by-case basis.

5.7.2.1   **Project Priority:** *M*

5.7.3   *Update Multimedia Offsite Support Capabilities*

A core capability of the HITSS contract is to be able to provide offsite presentation support to the NASA customer. This includes providing executive level support for launch events at KSC, symposia sponsored by the NASA History Office, and retreats requested by the NASA Administrator.

This project will provide a refresh of the software and hardware required for this type of support. Technologies that will be refreshed include laptops, projectors, portable projection screens, and other necessary hardware and software needed to perform agile support capabilities.

5.7.3.1   **Project Priority:** *M*

5.7.4   *Update Multimedia Architecture/Web Streaming*

The multimedia capabilities within NASA HQ have evolved to a point where the customer receives cutting-edge content for their Web sites, applications, videos, and outreach products. Enabling this type of enhanced experience allows NASA to attract talent to the science field and helps to accomplish the Agency's strategic vision of communicating to the younger generation.

This project will allow for increasing the capabilities in the area of 3-D animation, rich graphical interface development, integration of standards based protocols into Web development methodologies, and enhanced desktop and online visualization capabilities. The goal of this project is to implement an accessible means for the NASA customer to achieve a rich multimedia experience for any presentation or communication platform.

The Web streaming infrastructure at NASA HQ supports the live 24/7 streaming of NASA TV. The content produced from HQ ranges from shuttle launches to press conferences and can be viewed from NASA.gov as well as other sites throughout the Agency. The current streaming infrastructure supports Windows Media and RealMedia formats.

This project will provide enhancements to the types of media formats that can be streamed from NASA HQ. This will include updating the software and hardware needed to support the encoding and data delivery of the video content. Maintenance agreements for all software and hardware will be addressed.

5.7.4.1   Project Priority: *M*

5.7.5   *Customer Service Enhancements*

This project will examine ways to continuously enhance the customer service experience by examining the following;
- Getting out in front of issues and creating solutions
- Better understanding the environment, as this sets the context for success and contribution
- Creating a vision, a view on the future and how it will be realized
- Shaping and informing expectations, as they are the criteria by which results are measured
- Creating clear IT governance
- Weaving together NASA business and IT strategy
- Building new IT organizations as appropriate
- Building high performing IT teams as appropriate
- Managing IT risks
- Communicating performance

5.7.5.1   Project Priority: *M*

5.7.6   *Implement Automated Requirements, Test Suite, and Test Data Development*

Stress and functional testing against new and modified applications is currently a manual, time-consuming, and labor-intensive process prone to human error. This initiative proposes introduction of tools and procedures to automate the testing of applications for functionality, validity, performance, and other criteria as stated in the HITSS Software Management Guide. This effort builds upon previous assessments of tools and existing procedures to automate the creation of meaningful test data.

This project will implement an automated test suite that will predict system behavior with load testing, reduce resource requirements and the duration of test activities, and standardize test methodology. Furthermore, it will facilitate the troubleshooting of defects, whether application, logic, or performance related. As part of this initiative, a standardized requirements tool will be integrated into the application development process. This will ensure the maximum efficiency and benefit of the automated test suite. The residual benefit will be a central repository of standardized application requirements available for reuse.

5.7.6.1   **Project Priority:** *M*

5.7.7   *Common Set of Development/DBA tools*

In order to improve developer and Database Administrator (DBA) productivity, a common set of tools/software will be deployed across the developer and DBA communities. The proper standardized software toolset will foster collaboration, reduce errors, and increase productivity.

5.7.7.1   **Project Priority:** *M*

5.7.8   *MicroPact entelliTrak COTS Tool*

EntelliTrak™ is an enterprise-level, Web-based data tracking application that enables meaningful data management, tracking, retrieval and reporting without custom development. Additionally, entelliTrak affords faster processing of information, improved information assurance, enhanced operational efficiency, and better security. It is said to provide a rapid return on investment based on lower cost of ownership and immediate results. Purported to be both efficient and effective, entelliTrak satisfies data tracking needs.

EntelliTrak will be investigated to determine the feasibility and desirability of integrating this tool into the NASA HQ environment.

5.7.8.1   **Project Priority:** *M*

5.7.9   *Update HQ Based Search Engine*

Searching HQ Web sites and Web applications has the potential of bringing the NASA user relevant information about their program in an expedient manner. Today's Web viewers tend toward search-based browsing as opposed to navigating through hyperlinks.

This project will look at the implementation of relevant metadata within HQ-based Web sites and applications. This study will include, but will not be limited to, the standards and methodologies for the development of interoperable online metadata standards as recommended by the Dublin Core Metadata Initiative and the Agency Enterprise Architecture. In addition, a current and robust implementation of a search engine will be researched and implemented at HQ to allow for meaningful search results.

5.7.9.1   **Project Priority:** *M*

5.7.10   *COTS Survey Tool*

Many HQ service-providing organizations (from the I&M offices, General Counsel's office, Legislative Affairs Office, etc.) would like to survey the Federal employees and organizations they serve. Providing a generic Government employee survey tool that can be easily tailored and adapted to meet organization needs will be a cost-effective way to improve customer service throughout HQ.

This project will build upon research and analysis previously done, and it will include a pilot implementation of a COTS solution for customers to easily create and conduct surveys.

This project, upon acceptance of the recommendation and upon successful completion of the pilot, will include the procurement and implementation of the COTS Survey Tool.

5.7.10.1 Project Priority: *M*

5.7.11 *Service-Oriented Architecture (SOA)*

Unfortunately, each application requires a custom interface to satisfy its particular requirements, resulting in numerous point-to-point information flows. These flows are neither well understood by the enterprise as a whole, nor explicitly managed by server operations. Many of the applications at NASA HQ lack shared data and services among machines. This lack of transparency in the inherent dependencies among infrastructure components negatively affects the overall supportability of the infrastructure and the ability to plan effectively for high availability and disaster contingencies.

This project will recommend and, as appropriate, implement a Service-Oriented Architecture (SOA) model for NASA HQ applications. SOA atomizes IT services and aligns the IT architecture with the business architecture, so that applications can leverage one another via a published standard interface in business-to-business (B2B) fashion. This drives the re-use model from the code library level up to the service level, so that each IT function need only be designed, deployed, and supported once. Because the interfaces are standardized, they are easy to offer securely to both external and internal clients.

This effort will include a short study on the most capable and compatible SOA gateway candidates for the legacy HQ infrastructure. The technical approach envisions starting a SOA gateway service in the SEF that would a) create a registry of available services, b) manage the security of data sources, and c) provide a common data exchange mechanism for subscribed applications.

This effort includes documenting the as-is application architecture, developing and documenting the go-to architecture, and completion of a documented gap analysis between the as-is and the go-to application architectures. The effort also includes development of a plan to fill the gap and achieve the goal of the SOA for applications.

The SOA approach is to create many loosely coupled interoperable services that are organized around business practices; the services communicate with each other via a business-to-business (B2B) model. The power of SOA is in leveraging the use of these building-block services, rather than writing many large, monolithic applications that do many of the same things.

5.7.11.1 Project Priority: *M*

5.7.12 *Application Architecture Modeling Tools*

Movement to a model-driven application architecture is essential in view of shrinking budgets and mandates for greater efficiency. The development of component-model technologies that pull together the heterogeneous computing environments will make it easier to maintain and integrate new applications with a planned and controlled view toward enterprise management.

Initial tasks will center on the identification of core models that will represent the common features of NASA HQ applications within identified categories. Maximizing automation of the mapping step is a goal. Early efforts will simplify development projects and represent a significant gain through the use of consistent architectures.

The benefits of a model-based architecture begin at the time of service request submittal. New SRs could be examined to determine if a full or partial capability exists within the architecture and could net a cost avoidance in selected cases. A second benefit of a model-based architecture would be a reuse within the development process. Another benefit of a model-based architecture would be a maximized efficiency in streamlining, downsizing, or merging applications or capabilities.

5.7.12.1   Project Priority: *P*

5.7.13 *Implement Web Link Checker/Crawler*

A Web crawler (also known as a Web spider or Web robot) is a program or automated script that browses Web sites in a methodical, automated manner. Crawlers/Checkers can also be used for automating maintenance tasks on a Web site, such as checking links or validating HTML code.

Web Link Checker/Crawler will be implemented to validate links and HTML code on NASA HQ–hosted Web sites.

5.7.13.1   Project Priority: P

5.7.14 *Investigate New Web Application Reporting Tools*

Current NASA HQ reporting tools are based on the Crystal Reports version 10 COTS product and related proprietary data formats. This has resulted in Web applications requiring desktop installations of plug-ins to operate properly, thus reducing the portability and accessibly of Web applications.

This project will recommend and, as appropriate, implement a new reporting mechanism and standard for NASA HQ that addresses the shortcomings of Crystal Reports. The recommendation will include the recommended support model, an analysis of the one-time and recurring costs for maintenance, and a survey of the availability of personnel in the marketplace with the skill set required to support the new standard.

This project will review multiple vendor offerings and open-source options for providing large-scale reporting capabilities. Portable Document Format (PDF) and open-standards data formats will be investigated for HQ compatibility. If recommended, new reporting system(s) will be prototyped on development systems, tested in the SEF, and adopted as the replacement for Crystal Reports.

It should be noted that Crystal 11, which has been partially implemented, may meet all the above requirements.

5.7.14.1   Project Priority: *O*

5.8   IT Management

This category provides CIO functions including management of information assets and implementation of NASA and federal IT-related policies, procedures, regulations, and legislation.

5.8.1   *Enhanced Configuration Management Services for HQ IT Assets*

NASA HQ requires a Configuration Management (CM) repository and service that provides query capabilities across our IT assets. These assets include network components, voice services, appliances, servers, applications, software and affiliated documentation. Moreover the interrelationships and interdependencies of these components must be easily visible to support Business Impact Analysis, portfolio alignment, service outages, and reporting. Building on the groundwork of an aggregation service and the integration of a document repository, a Standard Operations Procedure repository, and DNS, this effort will be further enhanced to integrate monitoring services such as Patchlink to assure inventories are automatically updated. The service will be further enhanced to integrate a software library where production versions of applications reside. Data entry screens will be provided for BIA and Change Requests will be integrated. An update to HQ IT Work Management System to enable both efficiencies and integration will be incorporated as well as CPIC integration. A well designed, easy-to-use CM repository and service will increase reuse, and therefore reduce cost to the Government.

5.8.1.1   Project Priority: *M*

5.8.2   *IPv6 Capability for Perimeter and Core*

The Office of Personnel Management has mandated that all Federal Agencies transition their networks to support the routing, and use of Internet Protocol Version 6 (IPv6). This initiative is a continuation of prior year Tactical Plan initiatives that were focused on the upgrades of Headquarters core network systems necessary to support dual stack (IPv4 & IPv6) operations as well as native IPv6. These upgrades have been completed and the Headquarters network is fully capable of supporting IPv6 in a dual stack or native configuration. This initiative is to develop, in coordination with the Agency IPv6 working group and migration team, the Headquarters project implementation plans and schedules ensuring Headquarters remains in alignment with the Agency project team.

5.8.2.1   Project Priority: *M*

5.9   IT Security

This category includes Center-wide core IT security activities, for example, coordination of IT Security planning, Certification and Accreditation Official, Center perimeter firewall operations, patch management (Patchlink, and CIS), vulnerability scanning an reporting, FISMA reporting, incident response, penetration testing.

5.9.1   *Data Encryption Capability for Enterprise Storage*

Based on the June 23, 2006 OMB Executive Memo, "Encrypt all data on mobile computers/devices which carry Agency data unless the data is determined to be non-sensitive, in writing, by your Deputy Secretary or an individual he/she may designate in writing" and "In those instances where

personally identifiable information is transported to a remote site, implement NIST Special Publication 800-53 security controls ensuring that information is transported only in encrypted form." Additionally, "In those instances where personally identifiable information is being stored at a remote site, implement NIST Special Publication 800-53 security controls ensuring that information is stored only in encrypted form."

This guidance from the June 23 2006 OMB Executive Memo has been broadly interpreted to include off-site tape storage. Currently, NASA HQ uses a data vaulting vendor to store enterprise backup tapes. It is likely that these tapes contain PII data and currently these tapes are not encrypted.

This project will implement data encryption either on the primary enterprise data storage or on the enterprise backup tapes that are vaulted offsite.

5.9.1.1   Project Priority: *M*

5.9.2   *Caching Proxy/Reverse Proxy Architecture*

This project will study the best target architecture and technical approach, then prototype and deploy caching proxy and reverse proxy services at NASA HQ.

A proxy service will act as an interim agent when HQ customers access the Internet. The proxy examines the communications protocols (e.g., HTTP) to ensure they are correct and that they are not being used for an unintended purpose (e.g., buffer overflow, remote login). This has significant security benefits, and the use of proxies is becoming more prevalent.

Conversely, a reverse proxy service will act as an interim agent on behalf of HQ servers, as they are accessed internally and externally. The reverse proxy protects the servers from malformed protocols and intrusion attempts, thus improving their security.

Caching is the interim storage of frequently retrieved data for the immediate use of the next requester. To the extent that HQ customers browse the same Web sites, a caching proxy will "replay" the text and images already fetched by a previous requester. This greatly improves apparent access speeds while reducing Internet bandwidth utilization. Conversely, a caching reverse proxy for servers will reduce the burden on those servers by re-playing repetitive requests. This will extend useful server life and delay the need for upgrades.

The scope of this project includes: determining how best to integrate Proxy, Reverse Proxy, and caching into the HQ environment; identifying and acquiring the best products to meet NASA HQ requirements; and installing, testing, piloting, and deploying the hardware and software.

5.9.2.1   Project Priority: *M*

5.9.3   *Life Cycle Replacement of HQ Firewall Systems HW*

The current NASA HQ firewall infrastructure is running Checkpoint Firewall-1 NG AI R55. The end-of-life date for this software was in late 2006. In order to properly maintain the firewall management and enforcement points within the NASA HQ network, all platforms must be upgraded to Checkpoint Firewall-1 NGX Release 6.1. This initiative is in process. Existing network firewall

hardware will need to be replaced in FY 2009 when the hardware will reach end-of-life and end-of-vendor support.

5.9.3.1   Project Priority: *M*

5.9.4   *Implement Policy Compliance Scanning*

This project will investigate the available tool sets for implementing policy compliance scanning. These will include tools such as Watchfire® AppScan®, which automates Web application security audits to help ensure Web site security and compliance, or Web Inspect 7, a Web application security assessment tool re-architecture that analyzes complex Web applications built on emerging Web 2.0 technologies. This initiative will investigate the feasibility and practicality of implementing such technologies at NASA HQ.

This project will identify a set of tools that can assist in our efforts to ensure compliance with NIST SP 800-53 controls across all applications within the NASA HQ infrastructure. The main selling point for SCAP compatible products is that they provide automated features which allow HITSS Security to measure current NASA HQ security controls against federal information security guidelines (specifically NIST SP 800-53). In addition, SCAP compliant products will allow for more granular assessments of NASA HQ conformance to federal information security guidelines since each security configuration check will be mapped to a corresponding NIST SP 800-53 control. The intention is to identify SCAP compatible products that can be used to ensure a more effective way to enforce policy compliance within the NASA HQ.

5.9.4.1   Project Priority: *M*

5.9.5   *Improve Monitoring Capabilities with NETIQ Security Manager*

NetIQ Security Manager automates security activity reviews, log preservation, threat management, incident response, and change auditing. It provides strong protection of data residing on host systems, including servers, workstations, databases and the Active Directory infrastructure.

NetIQ Security Manager enhances the value of an existing security infrastructure by consolidating and archiving log and event data from across the organization. This solution provides a comprehensive built-in security knowledge base for analysis and remediation.

This project will build upon the existing production instances to continue implementation of NETIQ Security Manager at HQ.

5.9.5.1   Project Priority: *M*

5.9.6   *Improve IDS Infrastructure*

Intrusion detection systems (IDSs) detect malicious activity such as denial of service attacks, port scans, or host compromises by monitoring network traffic by reading network traffic and for suspicious patterns. If, for example, a large number of Transmission Control Protocol (TCP) connection requests to a very large number of different ports are observed, it could be evidence of a malicious port scan.

Current IDS sensors are approaching end-of-life and do not support IPv6. This initiative will determine whether the current NASA HQ IDSs are optimally placed within the network infrastructure and whether they should be upgraded or replaced. This project will also determine the applicability and feasibility of using Intrusion Prevention Systems (IPSs).

5.9.6.1   Project Priority: *M*

5.9.7   *Improve Forensic Capabilities*

Computer forensics focuses on finding digital evidence after a computer security incident has occurred. The goal of computer forensics is to do a structured investigation and find out exactly what happened on an information system or network and who was responsible. There are essentially three phases for recovering evidence from an information system: acquire, analyze, and report.

An analysis of available hardware and software forensic tools will be conducted, and the hardware and software needed to establish forensic capabilities for responding properly to security incidents will be procured.

5.9.7.1   Project Priority: *M*

5.9.8   *Security Content Automation Tools S-CAP*

This is a method for using specific tools to enable automated management and measurement of vulnerabilities and evaluation of associated policy compliance.
The Security Content Automation Protocol (SCAP) is essentially a large framework for managing known vulnerabilities and providing metrics for policy compliance. The intention of this project is to utilize a SCAP compliant tool that can leverage our ability to assure NASA HQ compliance with federal information security regulations.
A security tool is SCAP compatible if it complies with a minimum of three of the SCAP Standards. The specific SCAP specifications are:
- Common Vulnerabilities and Exposures (CVE) Compatibility
- Common Configuration Enumeration (CCE)
- Common Platform Enumeration (CPE) Compatibility
- Common Vulnerability Scoring System (CVSS) Compatibility
- Extensible Configuration Checklist Description (XCCDF) Format

5.9.8.1   Project Priority: *M*